THE COCONUT SCALE (*ASPIDIOTUS DESTRUCTOR*) AND ITS CONTROL

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The Coconut Scale is a small insect that feeds on the sap of the Coconut leaves. It could suck the sap from the leaf. As a result of several scale insects feeding on coconut leaves, the leaves turn yellow, without any possibility of green colour returning.

These insects have various shapes and sizes at different stages of development. At the stage they are easily seen on the coconut leaves, they appear as tiny round particles of sand on the underside of leaflets very

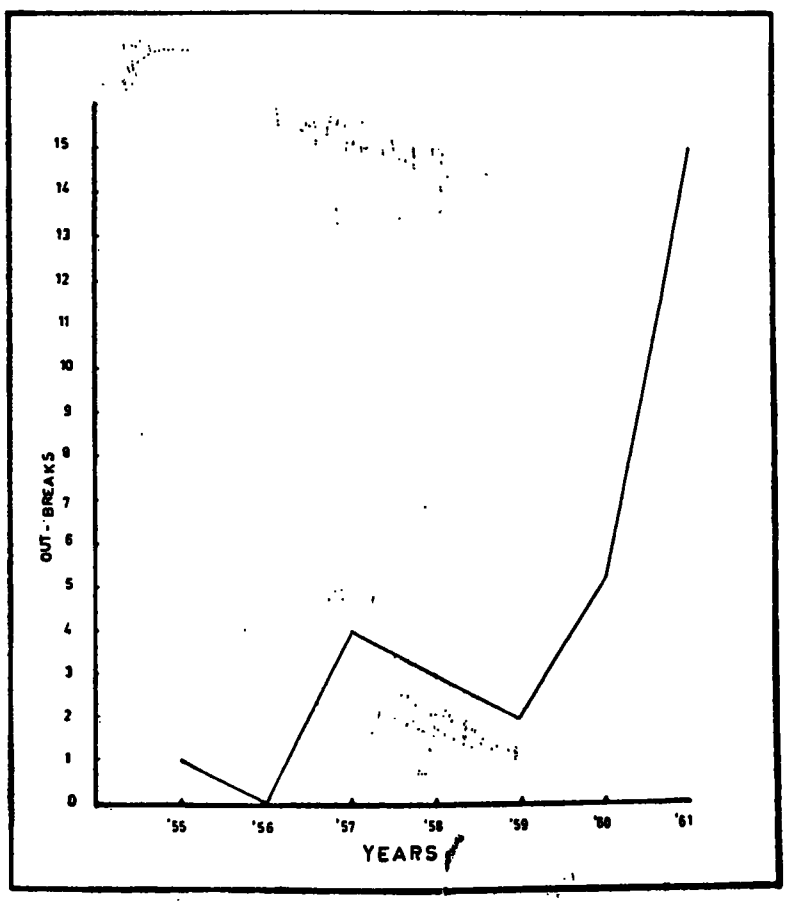


Fig. 1

closely attached to the leaf surface. When present in large numbers they may cover the whole frond and cause it to become yellow. Several fronds in the palm may be affected. The numbers of these insects can increase to that extent as to infest all the palms in an area of eight to ten acres or more.

The Coconut Scale insects are generally present in coconut plantations. Under normal conditions, natural control prevails; the Scale insect population begins to increase and the damage on leaves, that is the yellowing, is more noticeable when the favourable conditions remain prolonged and the infestation assumes the proportion of a pest out-break.

After looking into past records, it has been observed that Coconut Scale pest out-breaks before the year 1960, have been fluctuating consistently for a long period, on an average of five to ten major infestations for a year. Since 1960, the out-breaks have increased with a phenomenol rise in this year, 1961. The data collected is from the infestations that has been reported. It is possible that some infestations have not been reported. Fig. 1 illustrates the trends of major out-breaks from 1955 to 1961.

Economic Importance

In a heavily infested palm over 10 to 15 fronds can turn yellow. It could be reckoned that over one-third of the leaf surface, so vitally necessary for the palm, has lost its effective function. On a microscopic examination, it was observed that the yellowed areas were mottled with

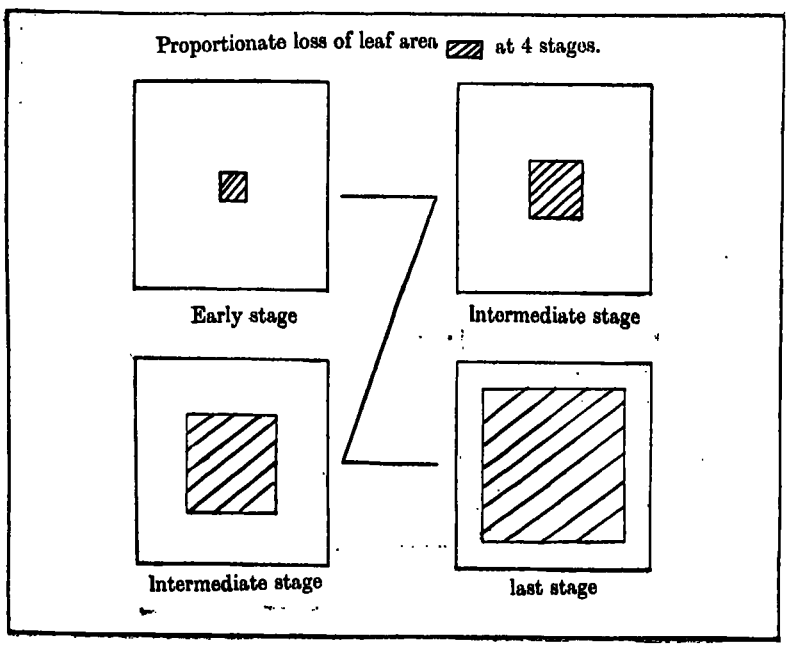


Fig. 2

green patches. It is not easy to understand the usefulness of these isolated green patches for the plant. A loss in yield, anyway, can be expected when it is seen that more than half the foliage of palms has turned yellow. Fig. 2 illustrate the proportionate areas of leaf damage from a study of affected leaf samples taken at various stages of infestation.

Decline in yield consequent to the pest damage, has been reported by some estates. With the present information in hand, it is not yet possible to express the loss of yield in definite terms.

Nature of Damage

The Scale insects, when they suck the sap, injure the leaf by the protrusion of a beak like organ. During the first few days of feeding there are no visible signs of damage on the leaf. As they continue feeding, the nymphs settle down where they started to feed; under the body of each scale insect the leaf tissues turns slightly yellow and this yellowing spreads outside the area covered by its body round patches. The scale insects in one colony constitute a crowded population. Thereby the yellowing becomes continuous.

If a single leaflet is examined, the yellow portions seen on the upper surface, corresponds to the spots where the scale insects inhabit on the under surface. The entire leaf surface up to near the apex may be covered by a teaming population of these insects, whence, nearly the entire leaf turns yellow. As stated earlier, several fronds are affected and many palms in one contiguous block may be observed to have turned yellow, when a large number of palms have turned yellow, the situation arouses great concern. The condition may be mistaken to be a mineral deficiency, or some such ill-effects.

Identification

An out-break of this pest cannot remain unnoticed. At an out-break a large area of two to ten acres, usually, will have palms with yellow foliage. It will be necessary to ascertain whether this yellowing is due to the pest damage. If a few of the affected fronds are cut at random in the field, and looked at on the underside of the leaflets, there should be present a white incrustration of scale like insects. If the nail of the thumb is pushed through this incrustration of scally matter, the insects will be dislogged and damaged. If the infestation is fresh, the damaged insects will deposit a slimy fluid. If the insects are dead, the fluff will get blown off.

Looking, with the aid of a hand lens, the insects will appear like small circular buttons. The dried specimens will have only scally fluffs. During wet weather, the specimens may be contaminated by fungus growth.

The smaller infestations are not easily observed. The patches of yellow on the green fronds are scattered but quite distinct in appearance where the colonies are located. A useful observation is that such localised patches of yellowing is characteristic of the infestations and this yellowing is different from the evenly spread out leaf yellowing caused by nutrient deficiencies and other causes.

Where the pest is present under the control of natural conditions, it is not easily noticed in a coconut plantation. They are yet present in very small colonies appearing on single leaflets, scattered about in the field.

The identification of pest damage can be final only after observing the scale insects on the underside of leaflets and not by merely assuming their presence by the yellow patches seen on the upper surface of leaves.

Life Cycle

Unlike the more common pest insects associated with the coconut palm, the Scale insects have a slightly different development in the stages of their lives.

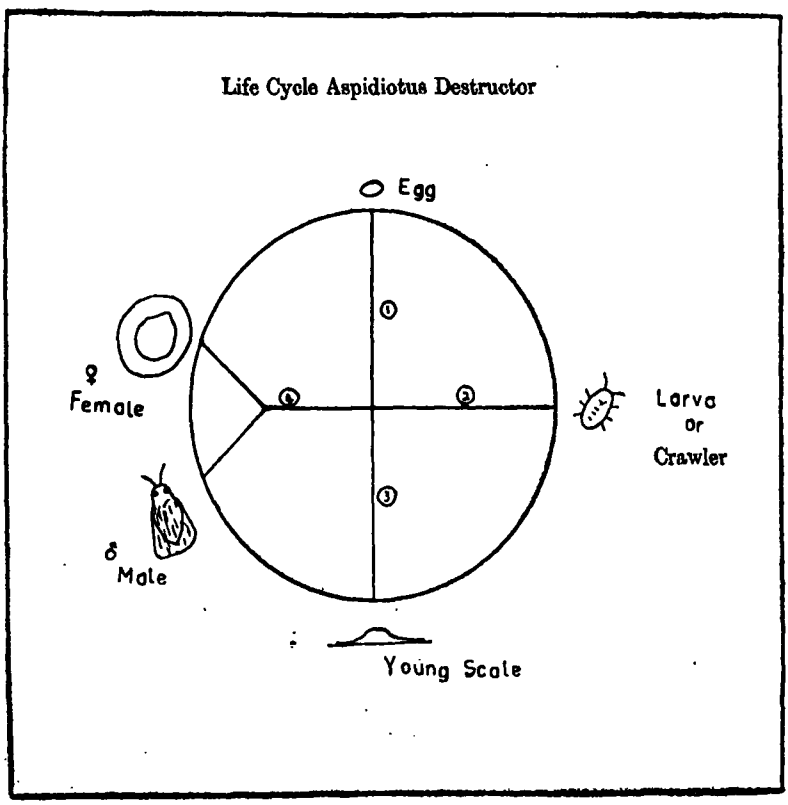


Fig. 3

The eggs when they hatch out produce Nymphs (Fig. 4). These nymphs are not easily seen without the aid of a lens. They have soft bodies, and possessing legs to crawl about. Under a powerful lens they could be seen moving about actively. When they find a green leaf they settle down to start feeding. A characteristic pose in the act of feeding, has been observed for the first time. In the course of feeding, the nymphs begin a sedentary stage in their life cycles. Once settled down, each one, puts on a scally covering over its body.

Fig. 4

Inside the scally covering the insect moults (shedding of the skin). During the moultings the nymph sheds its legs and gets transformed, gradually. The developing insects also differentiates into the sexes. The ratio observed is two females to one male.

Those that become males develop wings. Those that become females will remain sedentary (Fig. 5). The females become mature and capable of laying eggs. The average number of eggs counted per female has been around forty. The eggs were laid on the periphery of the female and under the scally covering.

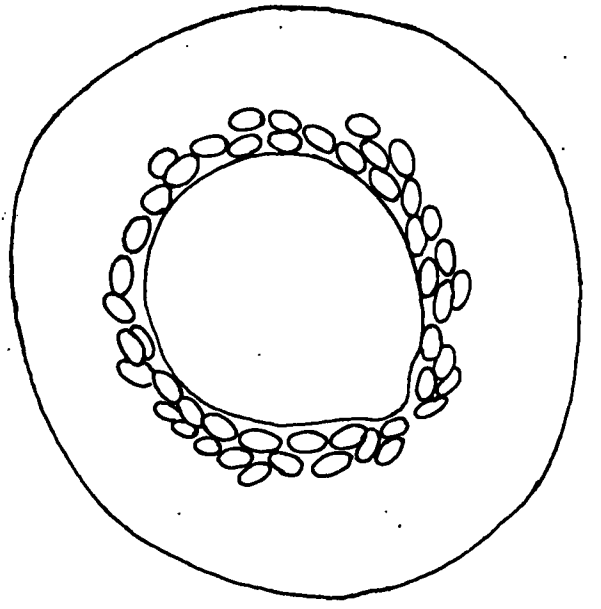


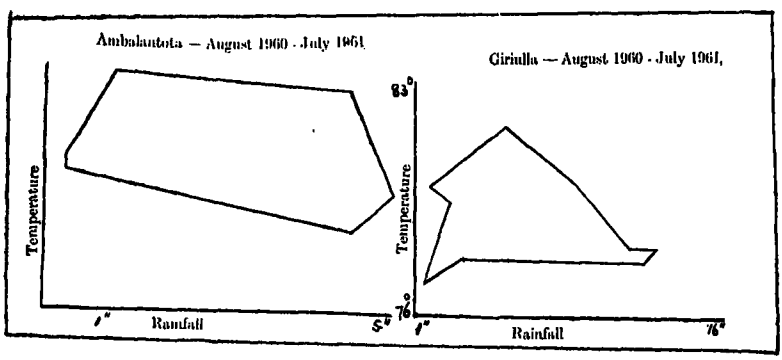
Fig. 5

The eggs are like tiny pearls, elliptical in shape, change to a light yellowish colour before hatching after about 120 hours of incubation.

Bionomics

Field studies of the pest have revealed that the Scale insects are generally present in coconut plantations. Under favourable weather conditions particularly prolonged droughts, the population of these insects increases gradually. The pattern of their behaviour towards more favourable conditions permit a gradual increase until a sudden build up of the infestation occurs, at which time, the pest assumes the proportion of an out-break. After a period of nearly six to nine months the populations again decline due to multiple reasons. In about one year's time the natural control operates, bringing down populations to non-significant level.

Climate has a profound influence on the well being or decline of these insects. When rainfall and temperature of the two places where the outbreaks were present were compared, there was no indication of a similarity of conditions. The pest can be present under varying conditions. The climatic patterns of the two places are illustrated in the figs., given below.

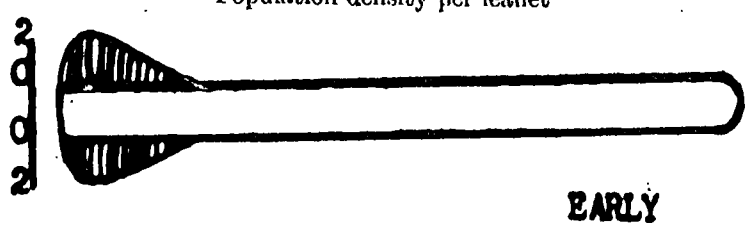


It has been observed that though the Coconut scale is regarded as a dry weather pest, once it is established, an infestation can tide over a wet period. With the rain the population will get diminished but may not be effectively controlled, as a result of the change of weather.

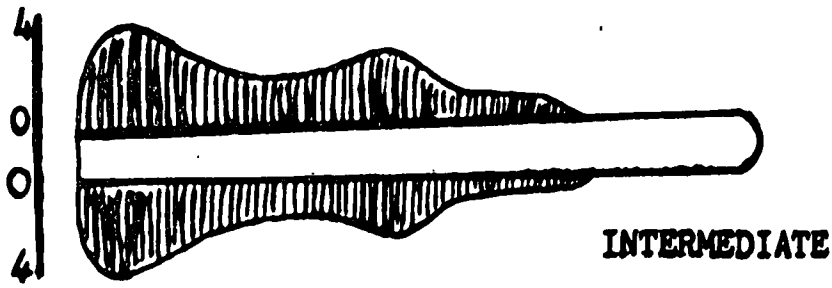
The dispersion of an infestation is largely effected by wind. The eggs and nymphs can be easily wind borne. Planters claim that they have seen the pest spreading in the direction of the wind.

A small colony of nymphs when placed on a leaflet, they moved towards the base of the leaflet where they naturally found better protection. The colony got first established there and passed through one generation. The population density observed in this colony is illustrated by a diagram given below.

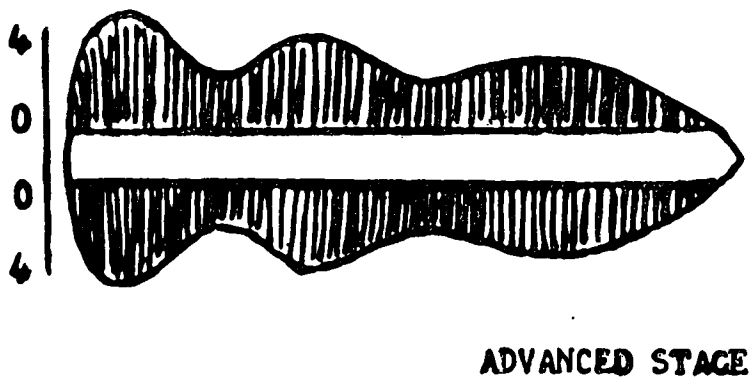
Population density per leaflet



The nymphs of the second generation moved towards the fresh green portions of the leaf away from the first colony, and they got themselves established towards middle portion of the leaflet. The population density noted at that time are illustrated in the diagram below.



When the leaflet was more or less completely covered, it was the third generation of the insects on the leaflet. The diagram below illustrates the densities of populations as reckoned at that time.



In the samples taken for population studies it was possible to count nearly 450 individual scale insects, living and dead, in an area of about 3 sq. centimeters. Calculating on the total area covered, on some sample leaflets, there emerged theoratical average figure of 5,84,200 individuals on a single leaflet.

Natural Control

Nature effects good control of the pest under normal conditions. Climate is most effective in determining the rate of population increase and decline. Generally dry weather is favourable for out-breaks, and

population densities can decline with the onset of rainy weather. As stated above, once an infestation is well established, it may tide over inclement weather.

Among the natural enemies of the Coconut Scale insect, the most important agent of biological control, in this country, is the Lady Bird Beetle, whose entomological term is *Chilocorus nigritus*. The Lady Bird Beetle is a small round black coloured beetle which could be collected, if looked for in Coconut Scale infested leaves. The beetle in its group stage is capable of eating up the live Scale insects. The beetle in its adult stage too feeds on the Scale insects. These beetles being beneficial insects should not be destroyed.

In a study of the effects of this predatory beetles in a coconut scale infested plantation it was observed that only about 40 per cent of the Scale populations were being destroyed by the Lady Bird Beetles, at the time of observation. Under these conditions the pest can make headway and in fact it was found to be so in this instance. Under normal conditions, it has been observed elsewhere, that the control effected by this predatory insect has been significant.

Importation of Exotic Predators

A project to import an exotic predator has been considered. The preliminary work is in progress.

Vigilance as the first step, in the control of this pest

In areas where out-breaks have occurred, it is important to exercise careful vigilance for re-infestations. It should be a regular practice in plantation management to look, for the first appearance of yellowing of leaves, due to the pest. In the early stages the yellow patches could be seen on leaflets of fronds. These colonies of insects may be found scattered in the plantation. With the spread of the pest, more patches of yellow on crowns of palms may be observed.

Early Treatment

If early detection is made it is quite a simple matter to control and prevent an out-break. All the affected leaves could be cut and burnt. The operation should be carried out in one instance in the whole area. Although it is not easy to illustrate the efficacy of this treatment by statistical findings, it can be emphatically stated that there are sufficient records to prove its value as a cheap and effective method of control.

Handling an out-break

If the pest has got out of hand, there is only a laborious and expensive treatment possible. Kerosene oil emulsion is the cheapest insecticide that could be sprayed to control it. The insecticide can be easily prepared with the following ingredients in the proportions mentioned below:—

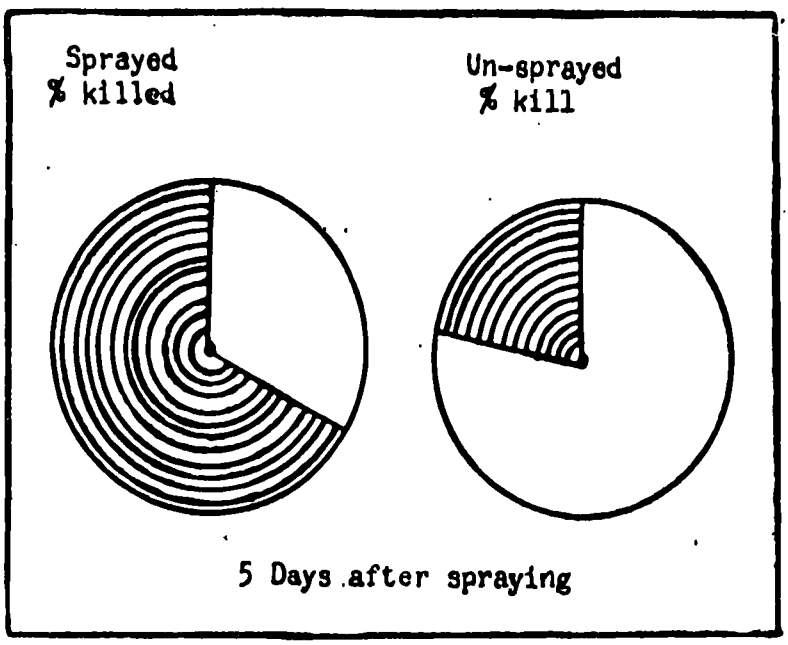
Laundry Soap	.. ..	1 lb.
Water	.. ..	2 gallons
Kerosene Oil	.. ..	4 gallons

The method of preparing the emulsion is as follows:—

Warm the water over a fire. Add to the warm water the soap in chips and stir. Take the soap water out of the fire and pour gradually, the kerosene oil, stirring all the time very vigorously. A thick creamy emulsion will be formed. This is the stock solution, which should be diluted with water before spraying. One part of the stock solution is mixed with 9 to 10 parts of water.

The emulsion should be well prepared to prevent the presence of free oil which can flow on the surface. This free oil if present, will scorch leaves. Accidental deaths of palms have been reported by spraying, carelessly prepared emulsions.

In an experimental spraying designed to test the efficacy of this insecticide, it has been observed that over 60 per cent kill has been obtained in a single treatment. Soon after the spraying was done, there were heavy prolonged rains. The results are diagrammatically illustrated below.



Crop Protection Service in the Control of the Pest

It is a difficult task to spray tall coconut palms. A spraying can however be done with the aid of heavy power sprayers. Since it is not economically advisable for estates to own such expensive equipment, the Coconut Research Institute has obtained a number of these power sprayers and a couple of trained officers constitutes a Crop Protection Service Unit at the Coconut Research Institute. The use of this unit is free of charge to the Planters. Spraying tall palms takes a long time, it being possible to cover only about 5 acres of sprayings per day. On occasions when the unit is in heavy demand, it has become necessary to list out the estates that require spraying in order of importants as reckoned from the severity of infestations. Planters are advised to call for this Unit when required, for spraying operations against the Coconut Scale insect pest.